

Chromadoridae (Chromadorida: Nematoda) from the Indian Ocean: Difficulties in morphological identification of *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920.

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Abstract

The diagnostic characteristics of *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920 are reviewed and their importance for genera diagnosis assessed. Three species of *Actinonema* and one species of *Rhips* are described. *Actinonema longicaudatum* Steiner, 1918 is characterised by short (2–3 μm long) anterior sensilla, cylindrical body with a rather narrow anterior end, lateral alae with inverted 'V'-patterns, wide (70–75 of cbd) double amphids and accessory pieces composed of only the telamon which is broad anteriorly and tapers on the posterior and a long tail. *Actinonema paraceltica* is characterised by long (4–5 μm) anterior sensilla, large amphids (83–88% of cbd), lateral differentiation of 'V' pattern on each annule and accessory pieces with telamons that have short extensions. *Actinonema smolae* sp. n. is characterised by long and thin body, large amphids located close to the anterior end and six solid cones. *Rhips reginae* n.sp. is characterised by six solid cones, large (90% cbd) amphids, lateral differentiation of two longitudinal rows of dots and double jointed spicules.

Introduction

The genera *Actinonema* Cobb, 1920 and *Rhips* Cobb, 1920 are closely related and the generic characteristics to distinguish both genera are not clear! It is hardly possible to decide about the generic affinity especially without adult males. Furthermore the structures often referred to as spicules in *Actinonema* are similar to the accessory pieces of *Rhips* (Platt & Zhang, 1982). In this paper, morphological characters were assessed in known and some undescribed species in an attempt to make the distinction clear between these two genera. Suggestions for synonymisation will also be made, although should be proven with 'molecular' methods.

Materials

Type material for described species were obtained from different Musea of natural history. Other material for undescribed species was provided by Gourbault and Boucher from the National Museum of Natural History in Paris. Our own material came from the Netherlands Indian Ocean Programme 1992–1995, (for sampling technique and location of sites refer to Muthumbi & Vincx (in press). Type specimens are deposited in the collection of Koninklijk Belgisch Instituut voor Natuurwetenschappen (KBIN) of Brussels (slide numbers RI546–RI553) and the Marine Biology section of the University of Ghent (MBRUG) (slide numbers 10414–10434).

The abbreviations used in the text are:

a: body length divided by maximum body diameter,

b: body length divided by pharyngeal length, c: body length divided by tail length, c': tail length divided by anal body diameter, abd: anal body diameter, cbd: corresponding body diameter, hd: head diameter at the level of the cephalic setae, L: body length, M: maximum body diameter, spic: spicule length, V%: position of vulva as a percentage of body length from anterior, v: vulva distance from the anterior.

Formula:

distance from the anterior to;

$$\frac{\text{head} \quad \text{end of the pharynx} \quad \text{M (vulva)} \quad \text{anus}}{\text{cbd}} \quad \text{total length}$$

All measurements (not ratios) are in micrometers and all curved structures are measured along the arc.

Actinonema or *Rhips*?

Actinonema and *Rhips* were first described by Cobb (1920) with the type species as *A. pachydermatum* and *R. ornata*. Cobb did not give the genera diagnosis but he distinguished the two species with the following characteristics: see Table 1.

Platt & Zhang (1982) stated that except for the double jointed spicules, the two genera are very closely related since both have similar amphids, cuticle patterns and six triangular cones as is described in *A. pachydermatum* Cobb, 1920 sensu Lorenzen (1972). According to Kulikov (1993), *Rhips* is characterised by large transversely elongated amphids, jointed spicules from two arcuate parts and the gubernaculum with two L-shaped auxiliary pieces.

We observed type material (of *Actinonema celtica* Boucher, 1976; *A. grafi* Jensen, 1991; *Rhips anoxybiotica* Jensen, 1985; *R. galapagensis* Blome, 1985; *R. gracicauda* Blome, 1985; and *R. paraornata* Platt & Zhang, 1982) and material of undescribed species collected from different parts of the world as well as our own material from the North Sea and the Indian Ocean.

We compared the following features: cuticle, anterior sensilla, cones, amphids, teeth, reproductive system in the different species of the two genera.

Cuticle

Both genera have a thick cuticle, with heterogenous ornamentation (basket work-like patterns especially at the pharyngeal region). The lateral differentiation begins at the pharyngeal region in most of the species of *Actinonema* and posterior of it in most species of *Rhips*.

However *R. anoxybiotica*, *R. gracicauda*, *Rhips reginae* sp. n. and *Rhips* sp 1 have lateral differentiation beginning within the pharyngeal region. The cuticular ornamentation is otherwise quite similar.

Anterior sensilla

The inner labial sensilla are papilliform and the outer labial together with the cephalic ones are setiform and in one circle in both genera.

Cuticular cones

Six solid cones were observed in both species of the two genera but more frequently in *Rhips* than in *Actinonema*. *Rhips anoxybiotica* and *Rhips* sp. 1 have no cones and, *Actinonema smolae* sp.n. and *Actinonema* sp. 1 have solid cones as well while *Actinonema pachydermatum sensu* Lorenzen, (1972) has cones with sclerotised edges.

Amphids

Most species of both genera are characterised by large cuticularized amphids with double margins. *Rhips ornata*, however, has weakly cuticularized margins (from Cobbs illustration).

Teeth

According to Cobb (1920), *Actinonema* has a small dorsal tooth and *Rhips* has a large dorsal tooth and two small sub-ventral ones. However, the re-description of *A. pachydermatum* by Lorenzen (1971) and by Boucher & Bovée (1971) shows a large dorsal and smaller sub-ventral ones. In nearly all the species of both *Actinonema* and *Rhips* there is a large dorsal tooth and sometimes smaller sub-ventral ones.

Reproductive system

a) Testis-vas deferens junction

A junction exists between the testis and the vas deferens which is a narrow passage with muscular lining. This structure was observed in *Actinonema celtica*, *Actinonema longicaudata* n. sp. and *Actinonema paraceltica* n. sp. and in *Rhips reginae* n. sp., *R. galapagensis* and *R. paraornata*. In other individuals the internal structures were either poorly preserved, poorly developed or they had small testis making it difficult

Table 1. Diagnostic characters of *Actinonema* and *Rhips* as mentioned in or derived from Cobb (1920) illustrations

	<i>Actinonema</i>	<i>Rhips</i>
Cuticle	Thick basket-work markings	Thick basket-work markings, very conspicuous
Lateral differentiation	Begins at pharyngeal region	probably begins posterior of the pharyngeal region
Cuticular cones	absent	present
Anterior sensilla	minute	ten setiform in one circle
Amphids	large, 80% cbd	80% cbd, weakly cuticularised (from Cobb's illustration)
Dorsal tooth	small	large, plus two subventral ones
Supplements	none	present on 25 annules
Spicules	simple, strong and stout	double jointed
Accessory pieces	frail, slender	five pieces, two in front, two behind and an additional median one behind

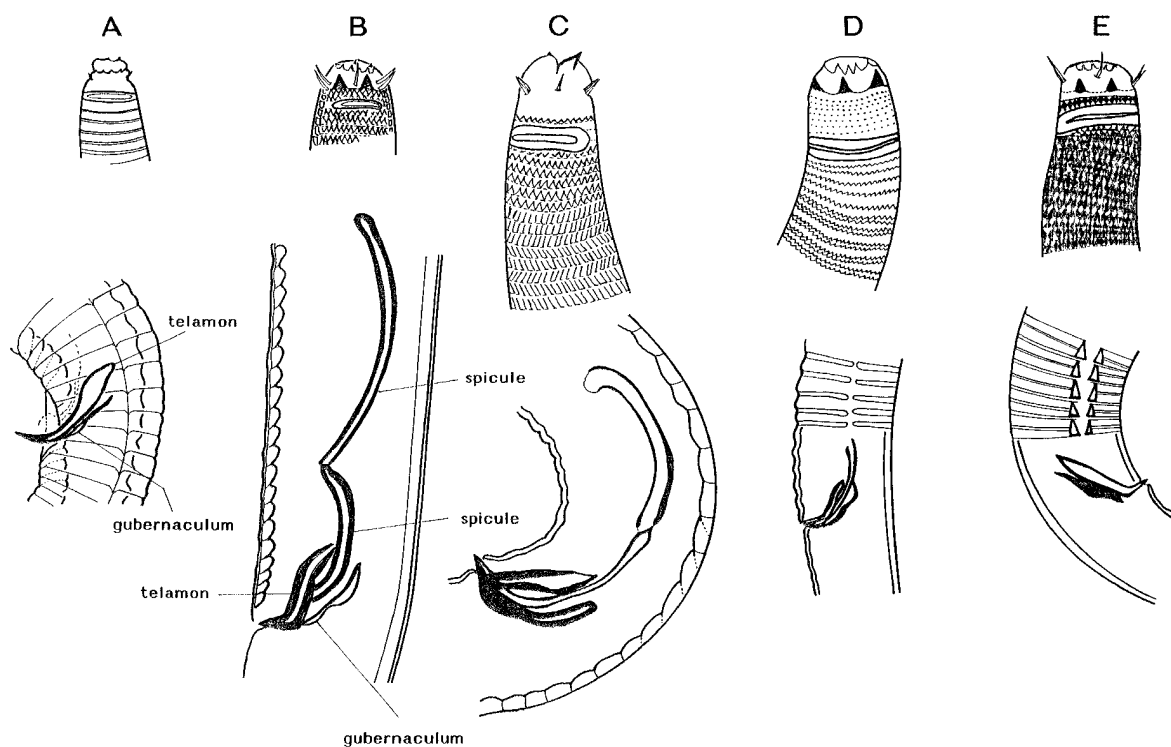


Figure 1. Heads and tails of different species of *Actinonema*: A: *Actinonema pachydermatum* Cobb, 1920 (after Cobb); B: *Rhips ornata* Cobb, 1920 (after Cobb); C: *Rhips* sp.1 (undescribed species from the Indian Ocean); D: *Actinonema* sp. 1 (undescribed species from the Indian Ocean); E: *Actinonema smolae* sp. n.

to see clearly. We suppose therefore, that this structure is present in species of both genera.

b) Spicules

According to Cobb, *Actinonema* has short spicules and *Rhips* has double ones. Platt & Zhang (1982), considered the spicules of *Actinonema* to be homologous to the lateral pieces of *Rhips* and that either the cuticular-

ized tubes are vestigial spicules or spicules are totally absent in *Actinonema*. The homology of the two seems reasonable but the tubes cannot be considered vestigial spicules considering that, the spicules in *Rhyps* are located in between the two pairs of the accessory pieces (accessory pieces as in Cobb, (1920) that is all cuticularised parts surrounding the spicule apart from the spicules themselves) but the tubes in *Actinonema* are actually extensions of the telamon (telamons being accessory pieces in front of the spicules while those behind it are gubernaculum as in Platt & Warwick (1988) and Figure 1A & B below) like in *A. grafi* Jensen, 1991. Thus we consider species of *Actinonema* with such structures to be lacking spicules altogether. There are however, species of *Actinonema* with short structures that are located in between the two pairs of accessory pieces as it is the case in *Rhyps* but have only the posterior part, such as *A. pachydermatum* (sensu Lorenzen, 1971) and *Actinonema* sp. 1 (Figure 1D). Other species of *Actinonema* have the telamon only like *Actinonema smolae* sp.n. (Figure 1E).

c) Accessory pieces

The accessory pieces are homologous in both genera being composed of a pair of telamons and two pieces of the gubernaculum. In some species of *Rhyps* however, it is possible that the gubernaculum has an extra median piece.

d) Supplements

Cobb (1920), observed – what he called – supplements in *Rhyps* (arising from 25 pre-cloacal annules) but none in *Actinonema*. In most species of *Rhyps* such structures have been observed but not in *Rhyps anoxybiotica* and *Rhyps gracilicauda*. Similar structures were observed in *A. celtica*, *A. grafi*, *Actinonema longicaudatum* Steiner, 1918 and *Actinonema paraceltica* sp.n. Thus supplements can be present or absent in species of both genera.

Discussion

Most of the characters that were first used to define the two genera by Cobb (1920) (Table 1) have been ignored by most authors as illustrated by the above analysis. There are however, two main characters that are still being considered specific to each genera; that is solid cones in *Rhyps*, absence of the same in *Actinonema* and double spicules in *Rhyps* and simple spicules

in *Actinonema*. From the above discussion and Figure 1A–E, it is clear that even these two characters are not stable within a genus and there are all kinds of combinations of characters sometimes making it difficult to assign the genera, *Actinonema* or *Rhyps*? If we assume that all species with solid cones are *Rhyps* and those without are *Actinonema*, where do species like *R. anoxybiotica* and *Rhyps* sp. 1 belong and what about *Actinonema smolae*, *Actinonema* sp.1 and *A. pachydermatum* sensu Lorenzen 1972, where are they placed? And if we assume that all species with double spicules are *Rhyps* and those without spicules *Actinonema*, how about species with simple spicules like *Actinonema* sp. 1 and *A. pachydermatum* sensu Lorenzen (1972) are they *Actinonema* or *Rhyps*, or yet another genus? Besides, there are reports of adult *Rhyps* losing their spicules and remaining with the accessory pieces only (Cobb, 1920; Pastor de Ward, 1985). It is possible therefore, to find individuals with double spicules, some without spicules and probably some with simple spicules as well and all belonging to the same species. The question then is, how important are the double jointed spicules in *Rhyps* for the survival and also as a diagnostic character?

Finally, in mixed populations with adult females and juveniles, it is difficult if not impossible to assign the **genera!** Since one of the purposes of nematode identification is to understand their assemblages in an attempt to understand the environment, the two genera may not be so different ecologically to be treated separately. We propose therefore that for ecological analysis if males with double spicules, simple spicules and no spicules occur together, they should be treated as one genus, i.e. *Actinonema*, (but add a note to this effect). There may be a higher margin of error when females and juveniles are put in the wrong genera than if all are put in one genus.

For the purpose of systematics on the basis of morphology we leave the two genera as *Rhyps* for species with double jointed spicules and *Actinonema* for species without spicules or with half spicules. The problem however, requires urgent attention. The solution may come from analysing the similarities and differences at the molecular level.

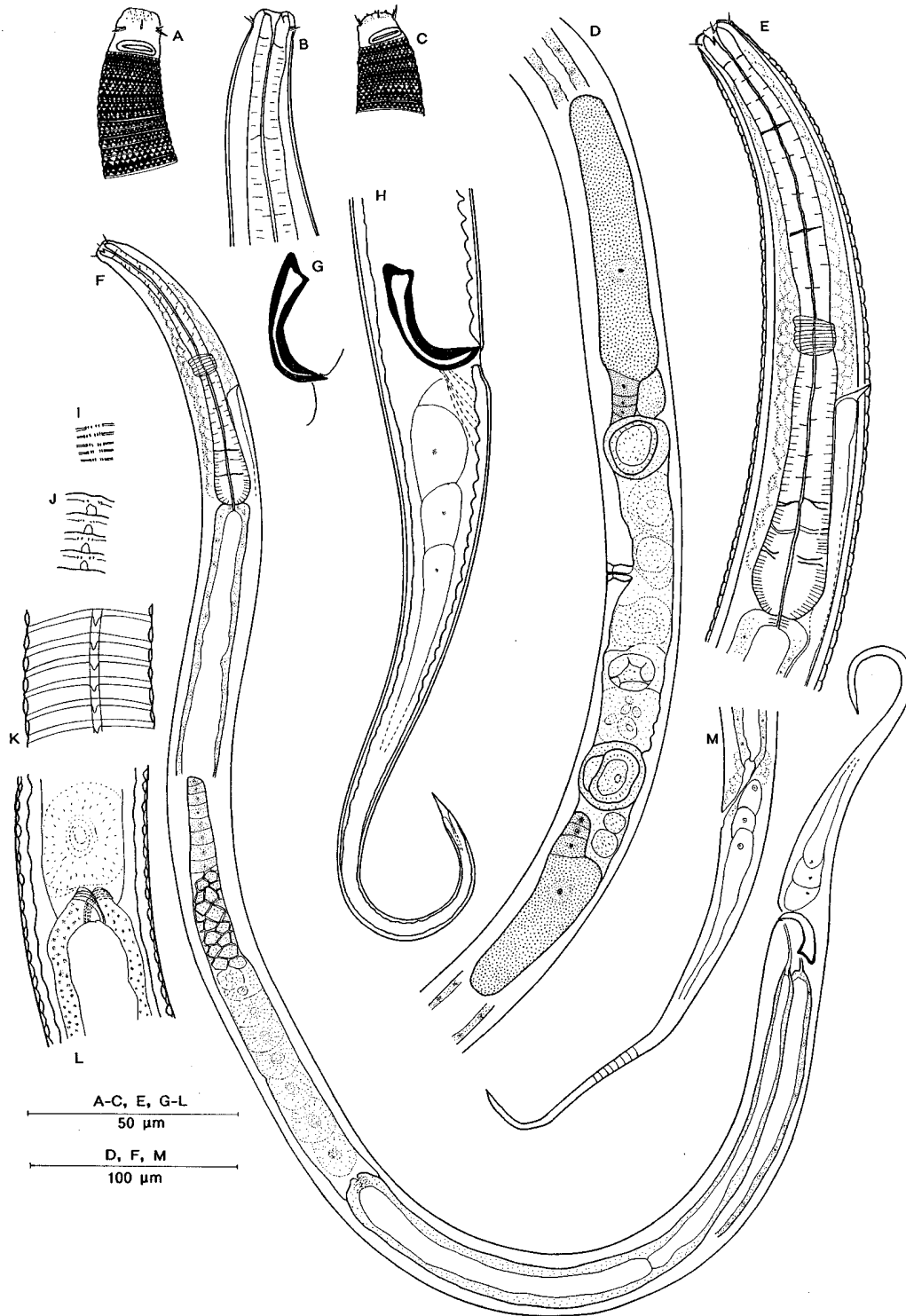


Figure 2. *Actinonema longicaudatum* Steiner, 1918: A: ♀₁ head (superficial); B: ♀₁ stoma; C: ♂₁ head (superficial); D: ♀₁ reproductive system; E: ♂₁ pharyngeal region; F: ♂₁ total body; G: ♂₁ spicules; H: ♂₁ tail; I: cuticle at bulb region; J: cuticle at posterior of pharyngeal region; K: cuticle at mid-body; L: ♂₁ testis-vas deferens junction; M: ♀₁ tail.

Descriptions

Actinonema longicaudatum Steiner 1918
(Figure 2A–M)

Material studied

Five males and four females on slide nos. RI546–RI547 and 10414–10419

Locality: Indian Ocean

Males from sts. 114 (1), 506 (1), 514 (σ_1), 528 (2),
Females from sts. 114 (3 including φ_1), 528 (1)

Measurements

$$\sigma_1 \frac{- \quad 78 \quad 149 \quad M \quad 873}{10 \quad 25 \quad 28 \quad 31 \quad 25} \quad 1057$$

a: 34.1; b: 7.1; c: 5.7; c': 7.4;

$$\varphi_1 \frac{- \quad 98 \quad 189 \quad 548 \quad 857}{9 \quad 27 \quad 30 \quad 32 \quad 23} \quad 1086$$

a: 33.9; b: 5.7; c: 5.1; c': 9.2; V: 50%

Other $\sigma \sigma$ s (5) L: 840–1205; a: 27.5–36; b: 6.0–6.6;
c: 4.7–6.0; c': 6.3–9.1

Other $\varphi \varphi$ s (4) L: 902–1251; a: 31.2–33.9; b: 5.7–6.9;
c: 5.1–6.5; c': 8.8–10.7; V: 46–50%

Description

Males: The body is cylindrical, tapering slightly anteriorly and the tail is elongate with a thin 2/3 cylindrical end part (Figure 2F). The head region is not set off but it narrows slightly at the very anterior part and twelve rugae surround the stoma. The cuticle is thick, annulated and heterogeneously punctated with basket-work like kind of markings at the pharyngeal region and less conspicuous markings on the rest of the body (Figure 2A & K). The lateral differentiation begins at the pharyngeal region and here it is simpler than on the rest of the body (Figure 2I & J). From mid body onwards the lateral differentiation is composed of thick transverse bars joining from both sides (dorsal and ventral), above which at superficial level there is a series of 'v'-shaped patterns either upright or inverted (Figure 2K). Somatic setae were not seen.

Inner labial sensilla are not obvious, outer labial and the cephalic ones are short 2–3 μm and at the same level. The amphids are large with a double contour located at 4–5 μm from the anterior; they are 3 μm in width and 76–80% of the cbd in length (Figure 2C). The stoma is small with a large dorsal hollow tooth.

The pharynx is cylindrical, 132–182 μm long, with a small terminal bulb, 54–66% of cbd at the widest part. The nerve ring surrounds the pharynx at 49–55% of the pharyngeal length from the anterior (Figure 2E). Cardia is small and flattened. The ventral gland was not seen but the gland opening is located at 10–12 μm behind the nerve ring.

The reproductive system is monorchic with outstretched testis located to the right of the intestine. The spermatozoa are large measuring $21 \times 23 \mu\text{m}$ (those that are about to enter the vas deferens) in diameter. The vas deferens is wide with thick walls and a wide lumen (Figure 2L). Spicules and gubernaculum absent and the telamons are flat with a broad anterior end and a narrow posterior end, they are 24–37 μm long (Figure 2G & H).

The tail is long, 144–212 μm , conical anteriorly and a long thin cylindrical posterior part.

Females: They are similar to males (Figure 2A, B & M). The reproductive system is amphidelphic with reflexed ovaries, anterior to the right, posterior to the left of the intestine. The vulva and vagina are simple (Figure 2D).

Differential diagnosis

Actinonema longicaudatum Steiner, 1918, can be recognised by the anterior slightly tapering head region, the lateral differentiation of the cuticle (thick cross bars and superficial 'v'-shaped structures), the position of the amphids from the anterior (4–5 μm from the anterior), the shape of the spicules, the large spermatozoa, the thick walled vas deferens with wide open lumen and the long tail.

Actinonema longicaudatum Steiner, 1918 differs from other described species in the shape of the telamons (they are thick, broad on the anterior end and taper on the posterior end) and it lacks any other accessory piece and the long tail. The present specimens are recognised as *A. longicaudatum* because of the shape of the anterior end (head region), the nature of the lateral differentiation and the measurements and ratios. These specimens however differs from other described specimens in that, the tail is shorter in this group ($c = 4.5$ in *A. longicaudatum* sensu Timm, 1961; $c = 4.1$ in *A. longicaudatum* sensu Blome, 1985 and $c = 3.8$ in *A. longicaudatum* sensu Steiner 1918 while $c = 4.7$ –6.5 in the present group).

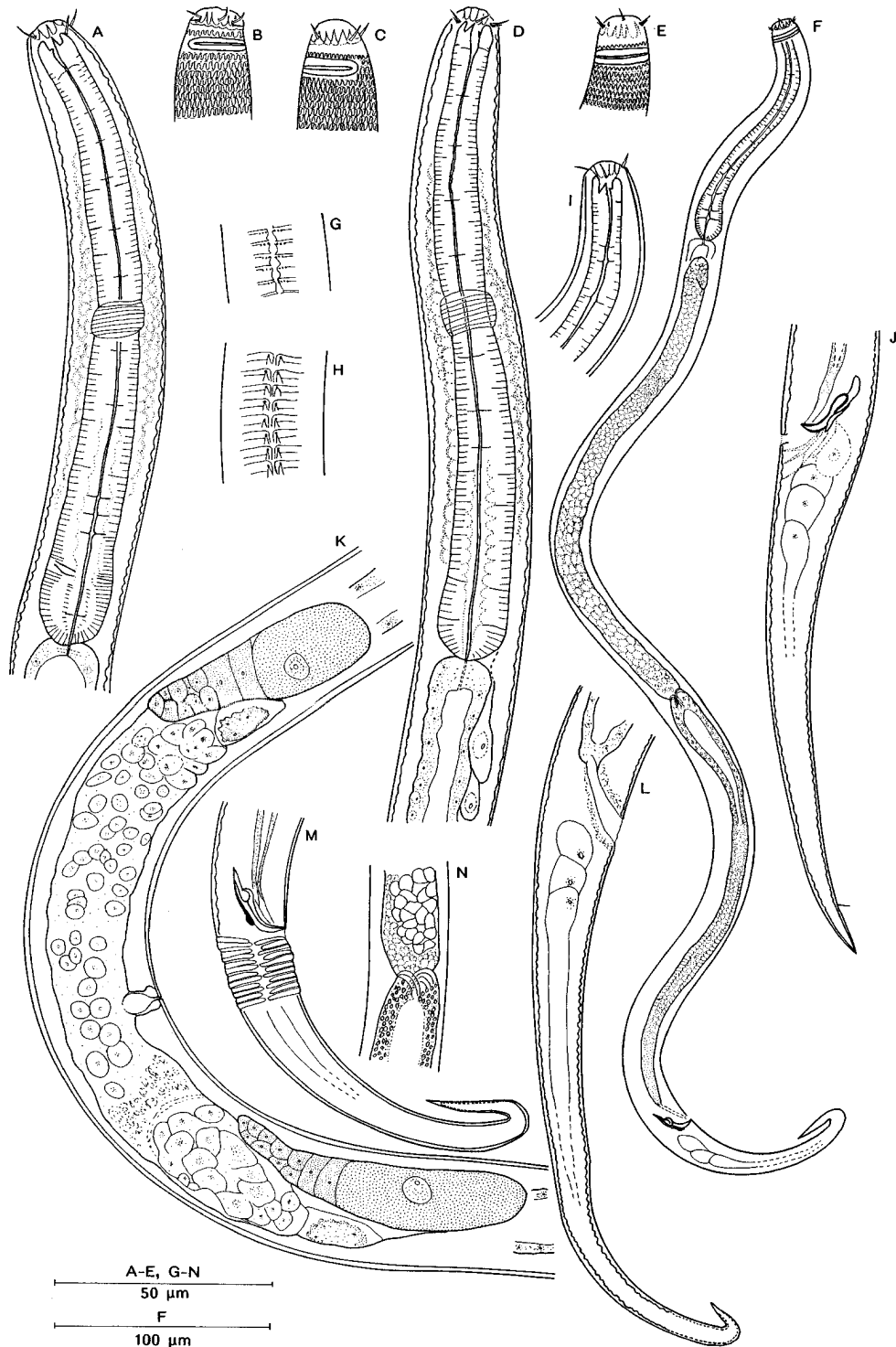


Figure 3. *Actinonema paraceltica* sp.n.: A: ♂₁ pharyngeal region; B: ♀₁ head (superficial); C: ♂₁ head (superficial); D: ♀₁ pharyngeal region; E: ♂₂ head (superficial); F: ♂₂ total body; G: lateral differentiation at the bulb region; H: lateral differentiation at mid-body; I: ♂₂ stoma; J: ♂₁ tail; K: ♀₁ reproductive system; L: ♀₁ tail; M: ♂₂ tail; N: ♂₂ testis-vas deferens junction.

Actinonema paraceltica sp.n. (Figure 3A–N)

Type material

Five males and four females on slide nos. RI546, RI548–RI549 and 10420–10425

Etymology

Name given because of its close resemblance to *Actinonema celtica* Boucher, 1976

Type locality

Males from sts. 117 (1), 133 (1), 505 (σ_1), 506 (1), and 518 and females from sts. 105 (φ_1), 114 (1), 117 (1) and 550 (1)

Measurements

$$\sigma_1 \frac{- \quad 66 \quad 143 \quad M \quad 749}{12 \quad 23 \quad 23 \quad 23 \quad 18} \quad 869$$

a: 37.9; b: 6.1; c: 7.2; c': 6.0

$$\varphi_1 \frac{- \quad 72 \quad 156 \quad 448 \quad 783}{11 \quad 23 \quad 24 \quad 29 \quad 18} \quad 928$$

a: 32.0; b: 6.0; c: 6.4; c': 8.1; V: 48%

Other $\sigma \sigma$ s L: 693–982; a: 33.0–40.9; b: 5.1–6.2; c: 6.5–7.2; c': 6.1–6.7

Other $\varphi \varphi$ s L: 638–950; a: 26.6–32.8; b: 5.5–5.8; c: 6.1–6.9; c': 7.0–8.1; V: 49

Description

Males: The body is cylindrical with a blunt anterior end and a conico-cylindrical tail; there is no tapering of the head region (Figure 3F). Cuticle heterogenous with complex patterns at the pharyngeal region and less conspicuous on the rest of the body (Figure 3C & E). Lateral differentiation begins at the level of the pharyngeal bulb and it is composed of two rows of thick dots on which two longitudinal rows of V-shaped structures are found superficially. At the anterior part of the body the lateral differentiation is less complex (with only longitudinal rows of double dots on either side) than on the rest of the body (Figure 3G & H). Somatic setae were not seen.

The amphids are large (90% of cbd) with a double contour, located at 6–7 μm from the anterior end. The anterior rugae are pronounced. Inner labial sensilla are not conspicuous, outer labial and the cephalic are 3–4 μm long and located at the same level. The stoma has a large dorsal hollow tooth and two small subventral ones. The pharynx is 113–175 μm long, cylindrical with a long enlarged terminal part that forms the bulb.

The nerve ring is located at 46–53% of the length of the pharyngeal length from the anterior. The ventral gland is small (probably they are two) located posterior of the pharyngo-intestinal junction (Figure 3A & D).

The reproductive system is monorchic with outstretched testis located to the right of the intestine. The spermatozoa are small and tend to cluster together as they get close to the vas deferens. The testis-vas deferens junction is clear and the vas deferens is thick walled but without a distinct lumen. The spicules are absent. The telamons are 18–25 μm long, they have thin extensions and a broad mid part and taper on the posterior end. The gubernaculum is short (11–14 μm long) and it is highly sclerotized (Figure 3J & M).

The tail is conico-cylindrical with an elongate narrow end. The tail is pointed and devoid of any annulation from 4–5 μm from the end.

Females: They are similar to the males (Figure 3B, D, L). Reproductive system is amphidelphic with reflexed ovaries, anterior to the right of the intestine, posterior to the left of it (Figure 3K). The vulva and vagina are simple.

Differential diagnosis

Actinonema paraceltica sp. n. is characterised by a blunt head end with conspicuous rugae, lateral differentiation with 'V' markings (two rows of superficial 'v-shaped' structures), large amphids (90% cbd), and a terminal bulb that is not set off from the rest of the pharynx, small spermatozoa that tend to cluster together and telamons with a thin extension from the capitulum.

Actinonema paraceltica sp. n. resembles *Actinonema grafi* Jensen, 1991 in measurements and the shape of the anterior end. However *A. grafi* is a thick nematode, thus the a-values are smaller than they are in *Actinonema paraceltica* sp.n. Besides, the lateral differentiation is different in the two species. *Actinonema paraceltica* sp.n. closely resembles *A. celtica* Boucher, 1976 in most measurements and ratios but differs from it in the nature of ornamentation on the lateral differentiation and the tail length. Although, *Actinonema celtica* is slightly longer (L: 772–1140 μm) compared to *Actinonema paraceltica* (L: 638–982 μm), the tail is relatively longer in the latter species (tail = 102–113 in *A. celtica* and 103–145 in *Actinonema paraceltica*) and consequently the c-values are larger in the former species (c = 7.3–10.7 in *A. celtica* and c = 6.1–7.2 in *Actinonema paraceltica*).

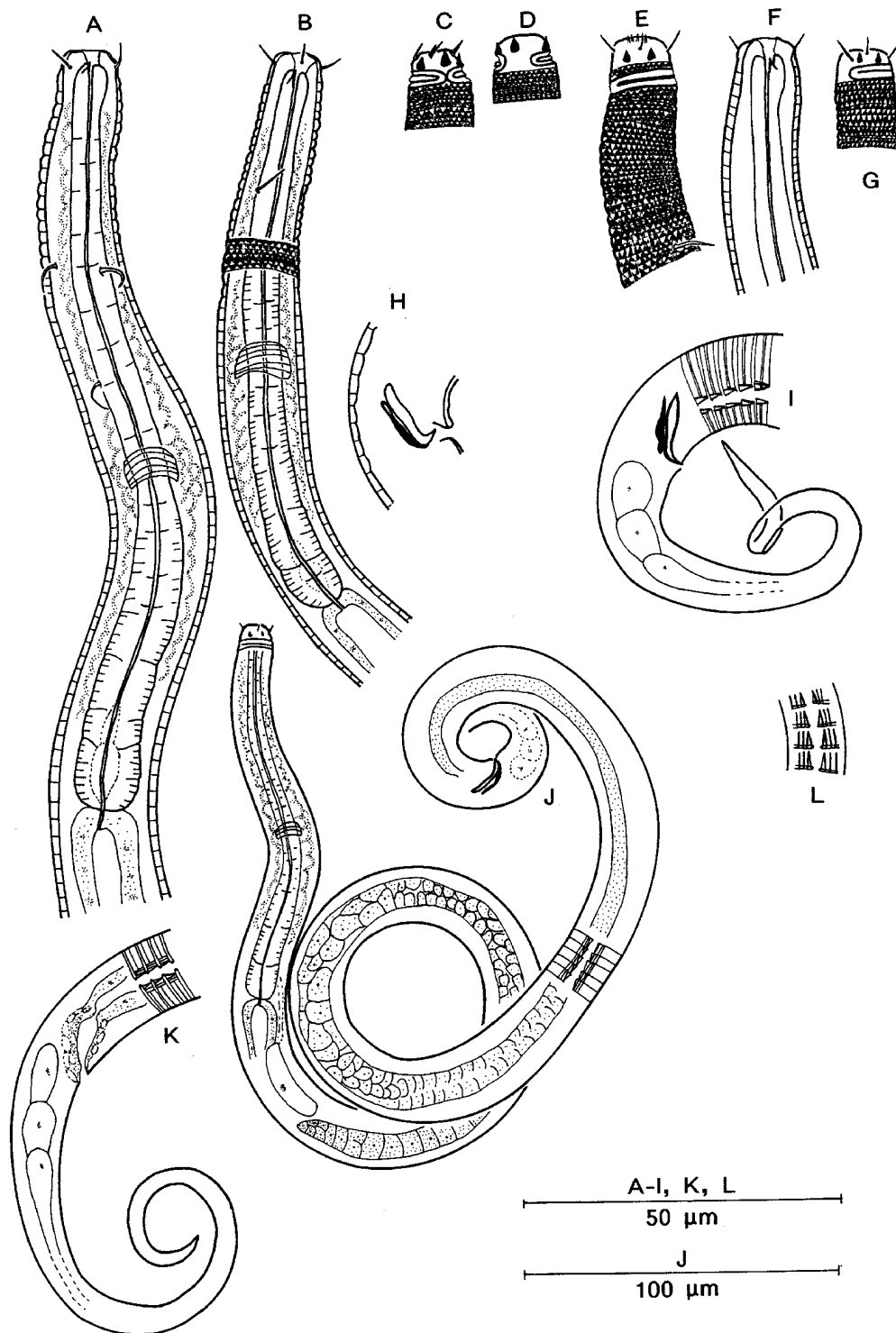


Figure 4. *Actinonema smolae* sp. n.: A: σ_1 pharyngeal region; B: φ_1 pharyngeal region; C: σ_2 ventral side of head (superficial); D: σ_2 dorsal side of head (superficial); E: σ_1 head (superficial); F: σ_1 stoma; G: φ_1 head (superficial); H: σ_1 spicules; I: σ_2 tail; J: σ_1 total; K: φ_1 tail; L: lateral differentiation at mid-body.

Actinonema smolae sp.n. (Figure 4A–L)

Type material

Three males and three females on slide nos. RI550–RI551 and 10426–10429

Etymology

Name given after Nic Smol, course co-ordinator of the International Nematology course in Gent.

Type locality

Males from sts. 103 (σ_1), 105, 550 and females from sts. 103 (φ_1), and 550 (2)

Measurements

$$\sigma_1 \frac{- \quad 66 \quad 122 \quad M \quad 634}{8 \quad 16 \quad 16 \quad 20 \quad 15} \quad 763$$

a: 38.1; b: 6.3; c: 5.9; c': 8.6

$$\varphi_1 \frac{- \quad 51 \quad 86 \quad 260 \quad 432}{8 \quad 13 \quad 13 \quad 14 \quad 10} \quad 548$$

a: 39.1; b: 6.4; c: 4.7; c': 11.6; V: 47%

Other $\sigma \sigma$ s L: 550–563; a: 40.2–34.4; b: 6.1–6.3; c: 5.9–7.1; c': 5.1–8.6

Other $\varphi \varphi$ s L: 512–749; a: 32.0–44.1; b: 5.8–7.8; c: 4.9–5.8; c': 8.9–10.8; V: 48–53%

Description

Male: The body is long cylindrical with almost uniform thickness, the anterior end is blunt and the tail is elongate cylindrical. The cuticle is heterogenous with the pharyngeal region having a basket-work kind of ornamentation. At the lateral differentiation there is a gap without any punctuation bordered by inverted '2 V' patterns on each annule (Figure 4L). The somatic setae are 5 μ m long and in four longitudinal rows, they are more conspicuous on the pharyngeal region than on the rest of the body (Figure 4A).

The amphids are large (90% cbd) with a double contour located at 3–4 μ m from the anterior end. In one specimen the amphids' boundaries were touching on the ventral side but not on the dorsal side (Figure 4C & D). There are six prominent solid cones whose bases are located at 2–3 μ m from the anterior end (Figure 4E). The six inner labial sensilla are inconspicuous, the six outer ones are 3–4 μ m long and the four cephalic ones are 2 μ m long (Figure 4E).

The stoma has small dorsal tooth and the sub ventral ones could not be located (Figure 4A & F). The pharynx is cylindrical, 86–122 μ m long, and enlarged

only slightly to form the posterior bulb which is 54–69% of the cbd. The nerve ring is located at 52–57% of the length of the pharynx from the anterior (Figure 4A). The ventral gland is small and located posterior of the pharyngo-intestinal junction. Cardia not prominent.

The reproductive system is monorchic, with the testis located to the left of the intestine. The spicules are absent and the telmons are 10–14 μ m long. The gubernaculum is short, 10–12 μ m long and solid (Figure 4H & I). The tail is conical cylindrical, 77–129 μ m long.

Females: They are similar to males in most aspects (Figure 4B, G, K). The reproductive system is amphidelphic with reflexed ovaries located, anterior to the right and posterior to the left of the intestines.

Differential diagnosis

Actinonema smolae sp. n. is characterised by six outer labial sensilla 3–4 μ m long and four cephalic sensilla 2 μ m long, six solid cones located at 2 μ m from the anterior end; large double amphids located immediately posterior of the cones and short accessory pieces but no spicules. Although, *A. pachydermatum* Cobb (1920) as redescribed by Lorenzen (1971), has cones, they are different as they are open compared to the solid ones in *Actinonema smolae* sp. n. *Actinonema smolae* also differs from *A. pachydermatum* in the ornamentation on the lateral differentiation and the presence of a large dorsal tooth in *A. pachydermatum*. *Actinonema smolae* sp.n. is about half as long as *A. pachydermatum*.

Rhips reginae sp. n. (Figure 5A–L)

Type material

Three males and four females on slide nos. RI552–RI553 and 10430–10434

Etymology

The name is given after Regine Coolen, secretary of the Marine Biology Section, University of Gent

Type locality

Males from sts. 120 (σ_1), 550, 132 and females from sts. 550 (3 including φ_1) and 505

Measurements

$$\sigma_1 \frac{- \quad 70 \quad 134 \quad M \quad 849}{10 \quad 18 \quad 18 \quad 19 \quad 17} \quad 958$$

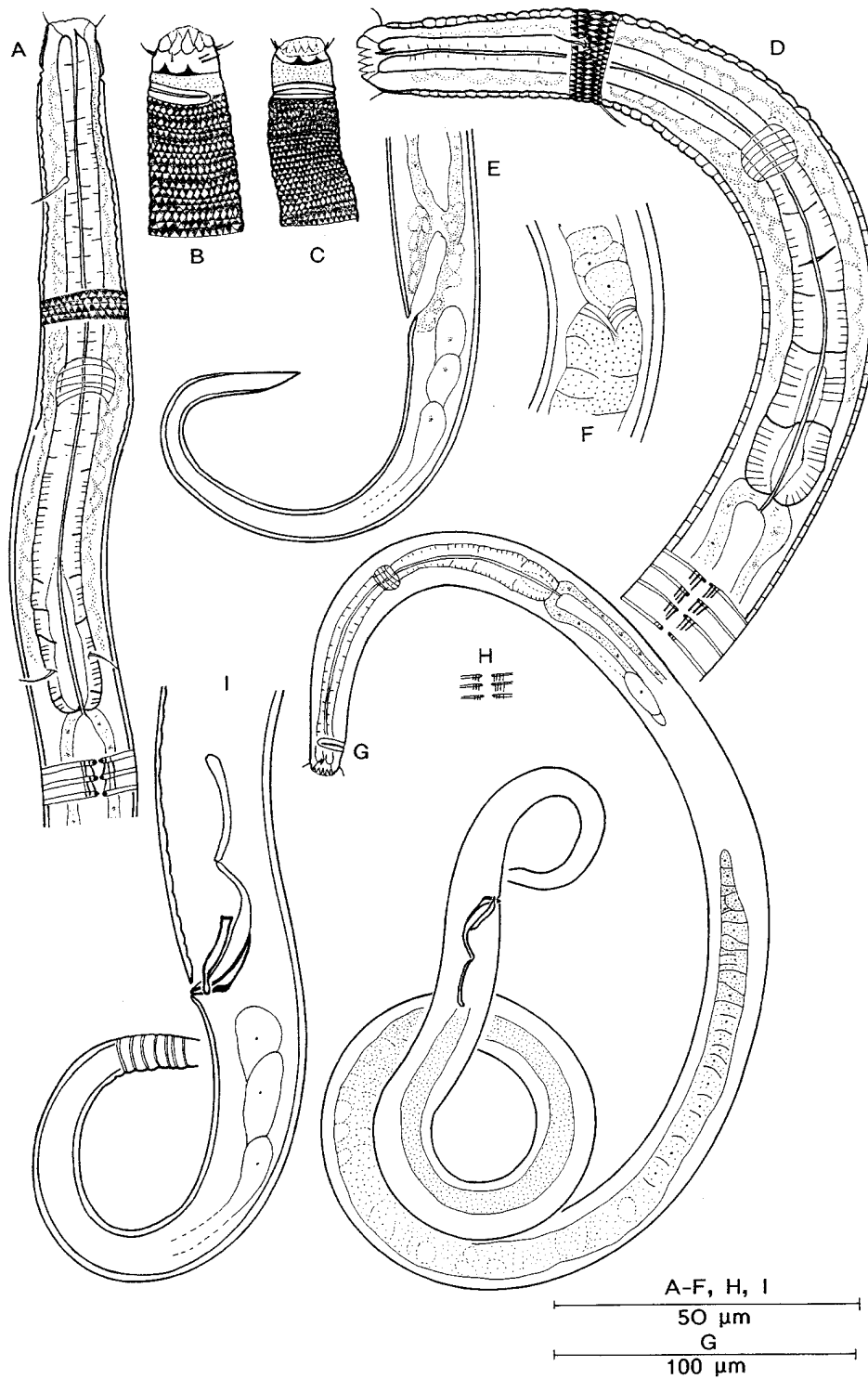


Figure 5. *Rhips reginae* sp.n.: A: ♀₁ pharyngeal region; B: ♂₁ head (superficial); C: ♀₁ head (superficial); D: ♂₁ pharyngeal region; E: ♀₁ tail; F: ♂₁ vas deferens-testis junction; G: ♂₁ total body; H: lateral differentiation at mid-body; I: ♂₁ tail and spicules.

(part of the tail broken off) spic: anterior part 17 μm , posterior 25 μm

$$\varphi_1 \frac{- \quad 58 \quad 115 \quad 300 \quad 491}{10 \quad 15 \quad 16 \quad 16 \quad 12} \quad 590$$

a: 36.9; b: 5.1; c: 6.0; c': 8.3; V: 51%

Other $\sigma \sigma$ s L: 591–680; a: 42.2–45.3; b: 5.9–6.1; c: 5.9–6.2; c': 7.3–8.2; spic: anterior 14–16 μm , posterior 19–20 μm

Other $\varphi \varphi$ s L: 584–605; a: 30.7–35.6; b: 5.3–6.0; c: 5.2–5.9; c': 7.9–10.2; V: 50–51%

Description

Male: The body is long and thin with uniform thickness and gradually narrowing on the tail end. The tail is cylindrical with a short conical anterior part (Figure 5G). The cuticle is heterogenous with a basket-work ornamentation at the pharyngeal region (Figure 5B). The lateral differentiation which begins within the pharyngeal region is simple and composed of two fine longitudinal rows of dots and striations on either side. The somatic setae are 4–5 μm long and in four longitudinal rows, they are more conspicuous on the pharyngeal region than on the rest of the body (Figure 5D).

The six inner labial sensilla are inconspicuous, the six outer are 4 μm long and the four cephalic ones are 2 μm long and at the same level as the outer labial. There are six solid cones with their bases located at 4 μm from the anterior end. The amphids are large (90% cbd), with a double contour and located at 7–9 μm from the anterior end (Figure 5B).

The stoma has a large hollow, dorsal tooth, the sub-ventral ones were not seen. The pharynx is cylindrical, 100–134 μm long, with slight enlargement at the terminal to form the bulb, 63–71% cbd in width. The nerve ring is located at 49–52% of the length of the pharynx from the anterior (Figure 5D). The ventral gland is small located posterior of the pharyngo-intestinal junction, the gland opening was not seen (Figure 5G).

The reproductive system is monorchic with outstretched testis located to the left of the intestine. The testis-vas deferens junction is narrow with longitudinal muscles (Figure 5F). The spicules are double jointed. The anterior part is thin and shorter (40–44% of the length of the whole spicule) than the posterior part. The posterior part is narrow anteriorly and broad posteriorly. The accessory pieces are four (five?). Two telamons 13 μm long on the ventral dorsal, two gubernaculum posterior of the spicules and probably a third highly

sclerotized piece located at the base of the gubernaculum (Figure 5I). There are 19–20 pre-cloacal annules that appear to have supplements.

The tail is 95–115 μm long, slightly conical at the anterior 1/4 part and cylindrical on the posterior part (Figure 5I).

Females: They are similar to males (Figure 5C, E). The reproductive system is amphidelphic with reflexed ovaries, located anterior to the right and posterior to the left of the intestine.

Differential diagnosis

Rhyps reginae sp. n. is characterised by long (4 μm long) outer labial and short (2 μm long) cephalic sensilla, six solid cones located (base) at 4 μm from the anterior end, large double amphids located at 7–9 μm from the anterior end, double jointed spicules and gubernaculum with several pieces.

Rhyps reginae sp. n. differs from other described species in the size (it has L < 1 mm while others have L > 1 mm long); amphids that are very wide (90% cbd) and the lateral differentiation is quite simple compared to the other species.

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